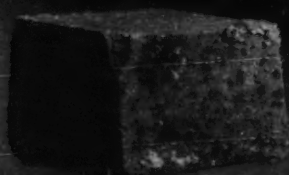


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FOR MANAGERS OF MANUFACTURING TECHNOLOGY

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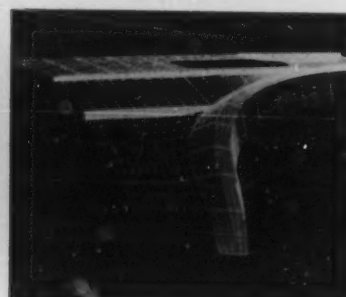




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Now Hear This!

Voice technology is making its return to the factory floor. You should hear how well it's doing.

By Al M. Senia
Regional Editor

REMEMBER VOICE TECHNOLOGY? WELL, it's back, and thanks to significant technology improvements, it's having a major impact in the manufacturing environment. With increasing frequency, computers are responding to human voice on the factory floor, allowing workers to capitalize upon computer assistance while maintaining the ability to concentrate on the task at hand. Increasing productivity and improving accuracy are the results.

So far, the largest use of voice technology in the factory setting has been for order entry, inventory and quality control—simple operations where an employee can use his voice instead of a notepad to keep track or inspect parts or other stock. But the industry is set to boom, and a variety of advanced applications are on the horizon, especially in the aerospace field.

At some more recent installations, voice has supplemented or replaced bar code or keyboard entry, increasing efficiency by three- or four-fold. Even more dramatic productivity gains are promised for the future, when voice is expected to encompass such areas as machine control, information management and the various components of computer-integrated manufacturing.

Voice can be used for such tasks as sorting parts and packages, activating CAD/CAM systems, controlling robotic arms and, of course, entering the serial numbers of parts.

The economic outlooks. Already officials and industry analysts estimate more than 10,000 voice-data systems are in place. Most are being used in the parts control and quality assurance areas. But the market is growing and expanding.

Some industry analysts foresee a \$1.5 billion annual market by the middle of the next decade, although it has thus far remained difficult to characterize and very undefined.

"It's not perceived as a large market yet," says one analyst with Future Computing Inc., a Texas-based research firm. "I'm real wary of characterizing it, since it is unclear to me that it is exactly a market at this time. We're talking technology rather than market."

Shelly Bakst, an analyst with International Data Corp., a Framingham, MA research firm, pegs the current U.S. voice recognition market at \$28.3 million, growing to \$68.3 million by 1989. What's fueling the rise in demand?

A variety of factors. Initial factory installation at such companies as Caterpillar Inc., Inland Steel, Gen-

eral Motors, Honeywell, Westinghouse, and others are proving successful, demonstrating the viability of the technology. The military is pouring millions of dollars in research and development efforts into futuristic weapons systems using voice.

Even more significantly, after leaving voice technology to relatively small pioneering developers such as Votan (Fremont, CA), Dragon Systems Inc. (Newton, MA), and Kurzweil Applied Intelligence (Waltham, MA), large manufacturers like AT&T, IBM, Intel Corp., Texas Instruments, and NEC Corp. have begun marketing their own voice systems. This has added more credibility to the technology, prodded greater R&D and introduced an element of price competition.

"A wave of applications is emerging from companies that began R&D efforts using TI-Speech™ products a year or more," explains Doug Palmer, speech marketing manager, Texas Instruments' Data Systems Group. "And with the upsurge in speech business that TI has experienced, we expect a further proliferation of applications in the future since development efforts typically take at least a year."

Inauspicious beginnings. Despite the excitement surrounding voice in

the manufacturing setting, the technology has taken a good deal of time to prove its worth. And it has found even wider use outside the manufacturing market in such industries as health care, the telephone industry and various consumer products.

In its simplest phase, voice synthesis, speech sounds are stored into memory chips and converted into audio signals that mimic human speech. The regional telephone companies, for example, have made wide use of this technology in their directory assistance services.

Speech synthesis first appeared as a consumer product in the automotive industry, when Japanese manufacturers briefly introduced cars with computer chips that would bark commands to drivers like "Buckle your seatbelt!" and "The front door is ajar!" But consumers became annoyed at the gimmick and the manufacturers retreated, putting the technology back on the shelf.

However, as the voice recognition segment of the industry has grown—the technology where the computer recognizes human speech and responds in a synthetic "speech-like" voice, often combining elements of artificial intelligence—new, dramatic applications came into prominence.

Voice in car production. Voice



Improved quality assurance at Austin-Rover is being attributed to the use of a Votan voice technology system used by inspectors.

technology eventually returned to the automotive industry.

The London-based Austin-Rover Group is using an IBM personal computer-based Votan voice system in its quality assurance operation for 5,000 vehicles daily. Company inspectors directly input defect information via headsets into a computer, instead of relying on clipboards and then keystroking the data.

Final car inspection time has been cut in half, has reduced errors by an estimated 80 percent and allows for the instantaneous communication of

quality assurance data to manufacturing areas where any mistakes are rectified.

Company officials said the system is also useful in compiling statistical trends and spotting consistent manufacturing problems, since quality information from every station is placed into a computerized databank from which managers can draw.

"The primary reason the system has been so successful at Austin-Rover is its almost universal acceptance by operators," comments Rob Anderson of the company's manu-

facturing systems division. "Once an operator has learned to produce a voice print that the system can recognize as his and begins to learn the words the system understands, training can be completed in about half an hour."

Anderson notes that most operators require approximately five days to become comfortable with the system.

Volkswagen of America is utilizing a voice-activated computer system on its final assembly line in New Stanton, PA. It may be expanded to quality control operations in the body and paint shops.

It uses a Westinghouse system that allows quality control checkers to stray 200 ft from a vehicle, transmitting data to a voice-activated computer via headset. Nearly 100 different items are checked daily; the system can recognize the voices of four employees.

The voice system cost Volkswagen approximately \$100,000. Officials say it has already paid for itself through productivity improvements.

The "Big Three" American automakers have been less successful with voice technology, although they have experimented with it since 1975. One official with Intel, which has been marketing turnkey voice systems to the automotive industry, said both Ford Motor Corp. and General Motors Corp. are poised to utilize the technology in parts inspection and final inspection tasks.

Intel already has installed an interactive voice system at a plant of Caterpillar Inc. in Davenport, IA. The system is used for quality control and inspection tasks, receiving and warehouse operations, data collection on the factory floor and inventory control.

Other quality assurance tasks. Voice systems also are being widely utilized for routine quality assurance tasks in the aerospace and electronics industries. At Rockwell International in Cedar Rapids, IA, a voice entry system increased the accuracy and ef-

U.S. Speech Recognition Market

	Shipments		Installed Base in Units
	Units	Millions of Dollars	
1986	20,600	\$21.65	42,100
1987	35,500	\$28.30	77,700
1988	78,400	\$45.60	155,900
1989	253,000	\$65.80	408,900

Source: International Data Corp., Framingham, MA

Will voice technology take off? Some companies are optimistic that it will, particularly since it is so widely applicable.

iciency of circuit board inspection between 30 and 40 percent.

Inspectors took two weeks to learn the system; officials say it has a recognition accuracy level of 95 percent. The system recognizes 40 to 50 words and phrases that indicate the location and the type of defect.

"The system is working fine," says Rockwell's Chuck Johnson. "It is different than anything else in the plant."

Vought Aero Products Group in Dallas also is using a Votan-designed voice system at the receiving dock, where workers verbally input into a host computer via wireless microphone, the materials that are arriving. The computer verifies and either accepts or rejects each shipment.

"We've tested the system at excessive noise levels...from forklifts, conveyor belts and yelling workers without any problems," says Doyle Landers, quality assurance systems analyst.

The Douglas Aircraft Division of McDonnell Douglas Corp. also is making successful use of voice technology as part of an ongoing quality assurance program at its Torrance, CA facility.

The system, developed a year ago by company employees, is used to

write more accurate failure and rejection reports on machined parts. It has eliminated many problems—such as poor spelling and grammar, invalid entries and indecipherable handwriting—that slowed the processing of rejection reports.

The system also prompts inspectors to provide all the information that engineers need to know, reducing return of the forms to the department.

It has been working successfully in a very noisy factory environment. Officials hope to expand the system throughout the plant by 1992.

Voice technology also has had an impact in quality assurance and inspection in more traditional heavy industry. Inland Steel Corp. installed a Votan VTR 6050 voice system to process steel more accurately.

Officials say their productivity has increased and their costs reduced by using voice data entry for the large slabs of steel that enter the mill and are processed through 15 different stations.

The data determines if the steel should be rolled into plates and heat-treated, flame cut or reprocessed. The voice system makes the information from each station available immediately, keeping the lines moving more efficiently and increasing accuracy as orders are processed.

"Each load used to be a hit-or-miss situation," explains one quality control official. "The system makes our jobs a lot easier and decreases the number of rejected loads." □

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